

Application No. 10/074,607
Response dated June 23, 2004
Reply to Office Action of January 23, 2004

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings of claims in the application:

Listing of Claims:

1. (Currently Amended) A fixation apparatus for being fixed to a bone to keep the bone in a fixed position relative to the apparatus during a healing process therefor, the fixation apparatus comprising:

at least one bone pin having a proximal end and a distal tip end configured for tightly gripping onto the bone;

a pin positioner that supports the pin to allow a user to manipulate the positioner external of a patient's body for positioning the pin to be advanced into engagement with the bone; **and**

a pin holder of the positioner for carrying the pin and having a pin advance assembly operably connected to the pin to allow a user to shift the pin in an advancing direction to bring the distal tip end into gripping engagement with the bone, the pin advance assembly being integrated with the pin holder for staying with the positioner during the healing process;

a housing of the pin holder mounted to the pin positioner and having an opening extending in the advancing direction; and

a support member of the pin advance assembly through which the pin extends for being advanced therethrough with the support member disposed in the housing opening and the pin advance assembly being operable to shift the support member together with the pin in the housing opening in the advancing direction for advancing the pin therewith.

2. (Original) The fixation apparatus of claim 1 wherein the pin advance assembly includes a locking mechanism including locking surfaces which allow the user to shift the pin to an engaged position with the bone with the locking surfaces engaged to substantially keep the pin from shifting in a retracting direction opposite the advancing direction and away from the engaged bone.

3. (Original) The fixation apparatus of claim 1 wherein the pin advance assembly includes a ratcheting mechanism between the pin holder and the pin which substantially keeps the pin from shifting away from the advanced position thereof.

4. (Currently Amended) The fixation apparatus of claim 1 wherein the pin holder ~~includes a housing having has~~ a through opening with the pin proximal end projecting out from the housing opening, and the pin advance assembly includes cam surfaces that allow a user to push on the pin projecting proximal end for shifting the pin in the advancing direction thereof and providing the user with optimal tactile feedback on secure engagement between the pin distal tip end and the bone.

5. (Original) The fixation apparatus of claim 4 wherein the pin advance assembly includes a lever, and stop surfaces and the cam surfaces being on the lever and the pin, and a biasing mechanism that urges the stop and cam surfaces together with a predetermined bias force so that pushing the pin proximal end causes the lever to shift against the bias force with the bias force sufficient to keep the pin from retracting away from the bone upon release of the pin.

6. (Original) The fixation apparatus of claim 1 wherein the pin positioner and the pin holder include a releasable attachment therebetween, and the pin holder comprises modules that carry one or multiple pins and pins of different sizes which allows a user to select the number and size of bone pins to be carried by the positioner.

7. (Currently Amended) ~~The fixation apparatus of claim 6~~ A fixation apparatus for being fixed to a bone to keep the bone in a fixed position relative to the apparatus during a healing process therefor, the fixation apparatus comprising:

at least one bone pin having a proximal end and a distal tip end configured for tightly gripping onto the bone;

a pin positioner that supports the pin to allow a user to manipulate the positioner external of a patient's body for positioning the pin to be advanced into engagement with the bone; and

a pin holder of the positioner for carrying the pin and having a pin advance assembly operably connected to the pin to allow a user to shift the pin in an advancing direction to bring the distal tip end into gripping engagement with the bone, the pin advance assembly being integrated with the pin holder for staying with the positioner during the healing process;

wherein the pin positioner and the pin holder include a releasable attachment therebetween, and the pin holder comprises modules that carry one or multiple pins and pins of different sizes which allows a user to select the number and size of bone pins to be carried by the positioner;

wherein the pin positioner comprises at least one rigid member having opposite ends, and the releasable attachment includes interengaging mounting flanges of at least one of the ends of the positioner member and the pin holder module for mounting the module at a predetermined position on the rigid member end, and a detent between the rigid member end and the module operable to releasably secure the module at the predetermined position thereof on the rigid member end with the pin retracted away from the bone.

8. (Original) The fixation apparatus of claim 1 wherein the pin positioner comprises a plurality of rigid members having a plurality of fixed positions relative to each other to allow the associated pin holders to be oriented at various different positions relative

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to each other about the bone to obtain different angles of orientation for the bone pins carried thereby relative to the bone.

9. (Original) The fixation apparatus of claim 1 wherein the pin advance assembly includes a fine adjustment device operable to advance the pin with fine force adjustments and with high resolution feedback of pin-to-bone engagement forces to the user.

10. (Currently Amended) A bone fixation apparatus comprising:
at least one elongate bone pin having a proximal end and a distal bone gripping end;

an external pin positioner member for supporting the pin in gripping engagement with a bone from external of a patient's body; and

a pin advancing mechanism mounted to the positioner member having an opening through which the pin extends for being shifted with coarse adjustments into advanced positions of the pin and into engagement with a bone upon application of manual force to the pin proximal end, and an adjustment device which allows for fine adjustments to be made to the advanced positions of the pin for fine tuning of engagement forces between the pin and bone so that the pin is secured to the bone with a two-stage application procedure.

11. (Original) The bone fixation apparatus of claim 10 wherein the pin advancing mechanism includes a housing with the opening for the pin formed therein, and the adjustment device is a screw member threaded in the opening for being advanced into the housing with turning thereof.

12. (Currently Amended) The bone fixation apparatus of claim 10 A bone fixation apparatus comprising:
at least one elongate bone pin having a proximal end and a distal bone gripping end;

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an external pin positioner member for supporting the pin in gripping engagement with a bone from external of a patient's body; and
a pin advancing mechanism mounted to the positioner member having an opening through which the pin extends for being shifted into advanced positions of the pin and into engagement with a bone upon application of manual force to the pin proximal end, and an adjustment device which allows for fine adjustments to be made to the advanced positions of the pin for fine tuning of engagement forces between the pin and bone;

wherein the advancing mechanism comprises a ratchet assembly to provide coarse adjustments to the pin advanced positions and which is substantially fixed to the pin upon removal of manual force therefrom, and the fine adjustment device comprises a screw device for being turned and advanced into engagement with the ratchet assembly to fine tune the advanced position of the pin.

13. (Original) The bone fixation apparatus of claim 12 wherein the advancing mechanism includes a housing fixed to the positioner member and having the opening which receives the screw device threaded therein, the housing further having a slot, and the ratchet assembly includes a follower that is engaged by the screw member with turning thereof for being advanced in the slot, the slot having a predetermined length to define a predetermined amount of fine tune adjustment for the pin.

14. ~~The bone fixation apparatus of claim 10-~~ A bone fixation apparatus comprising:
at least one elongate bone pin having a proximal end and a distal bone gripping end;
an external pin positioner member for supporting the pin in gripping engagement with a bone from external of a patient's body; and
a pin advancing mechanism mounted to the positioner member having an opening through which the pin extends for being shifted into advanced positions of the pin and into

engagement with a bone upon application of manual force to the pin proximal end, and an adjustment device which allows for fine adjustments to be made to the advanced positions of the pin for fine tuning of engagement forces between the pin and bone; and

wherein the advancing mechanism includes a release member and a plurality of teeth along the bone pin with the release member biased with a predetermined bias force into engagement with the teeth to keep the advanced pin from retracting away from the bone.

15. (Original) The bone fixation apparatus of claim 14 wherein the release member includes one of a button that is shifted in a linear direction against the bias force and a lever that is pivoted against the bias force to allow the pin to be advanced into engagement with a bone.

16. (Cancelled)

17. (Cancelled)

18. (Cancelled)

19. (Cancelled)

20. (Cancelled)

21. (Cancelled)

22. (Currently Amended) A bone fixation apparatus comprising:
a plurality of bone pins;
a pair of pin positioner members each supporting at least one bone pin and having
arcuately configured bodies;
an adjustable connection between the arcuate bodies to allow the pins supported
thereby to be angularly shifted about a an axis of an elongate bone for obtaining different
angles of orientation to the bone with the bodies generally being adjusted in a single plane
transverse to the bone axis so that the bodies extend in a substantially continuous arcuate
configuration from a free end of one of the bodies to a free end of the other body; and
pin holders attached to the bodies in which the pins are carried for being advanced
into gripping engagement with the bone.

23. (Original) The bone fixation apparatus of claim 22 wherein the adjustable
connection comprises a plurality of spaced apertures along at least one of the positioner
bodies and a connecting member mounted to the other positioner body for being secured in a
selected one of the spaced apertures.

24. (Original) The bone fixation apparatus of claim 23 wherein the adjustable
connection comprises a set of spaced apertures along both of the positioner bodies with the
apertures in at least one of the sets being threaded and the connecting member being a
threaded fastener.

25. (Original) The bone fixation apparatus of claim 22 wherein the adjustable
connection comprises a tongue and groove on respective positioner bodies for guiding sliding
movement of the bodies between different connected positions relative to each other.

26. (Original) The bone fixation apparatus of claim 22 wherein the bodies have a predetermined cross-sectional configuration that is other than flat to increase the moment of inertia and strength thereof.

27. (Original) The bone fixation apparatus of claim 26 wherein one of the bodies has a generally U-shaped cross-sectional configuration and the other body has a generally T-shaped cross-sectional configuration.

28. (Original) The bone fixation apparatus of claim 22 wherein the pin holders are releasably connected to one of the ends of each of the pin positioner bodies, the adjustable connection allows the bodies to be detached from one another, and one of the pin positioner bodies includes a pin opening at an opposite end to the one thereof for removably receiving a pin fixed therein with the bodies detached from each other.

29. (Original) The bone fixation apparatus of claim 22 wherein the pin holders are modules carrying one or multiple bone pins with the modules releasable connected to one of the ends of each of the positioner bodies.

30. (Cancelled)

31. (Cancelled)

32. (Cancelled)

33. (Cancelled)

34. (Cancelled)

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35. (Cancelled)

36. (Cancelled)

37. (Cancelled)